529

COMPILATION AND EVALUATION OF PERFORMANCE AND COST DATA OF EXISTING WASTE DISPOSAL SYSTEMS IN USE AT REST STOP AREAS IN INDIANA

SEPTEMBER 1972 – NUMBER 27

BY

J. E. ETZEL

A. J. STEFFEN

D. W. HAWKINS

JOHN HECKLER

JHRP

JOINT HIGHWAY RESEARCH PROJECT

PURDUE UNIVERSITY AND

INDIANA STATE HIGHWAY COMMISSION

Final Report

Phase II

COMPILATION AND EVALUATION OF PERFORMANCE AND COST DATA OF EXISTING WASTE DISPOSAL SYSTEMS IN USE AT REST STOP AREAS IN INDIANA

TO: J. F. McLaughlin, Director
Joint Highway Research Project

September 7, 1972

File: 9-11-6

FROM: H. L. Michael, Associate Director
Joint Highway Research Project

Project: C-36-67F

The attached Final Report on Phase II of the HPR Part II Research Study titled "Treatment of Sanitary Wastes at Interstate Rest Areas" is submitted as fulfillment of the objectives of that phase. The Report is titled "Compilation and Evaluation of Performance and Cost Data of Existing Waste Disposal Systems In Use at Rest Stop Areas in Indiana".

This phase of the study included a comprehensive survey in 1971 of seven (7) rest stop areas in Indiana, an evaluation of the basic parameters involving usage and problems of the existing systems. The data obtained was also used in developing the design parameters for the proposed waste treatment systems proposed for Phase III of this Study. Cost data for existing systems is also included.

This Report will also be submitted to the ISHC and the FHWA for review, comment and acceptance as fulfilling the objectives of Phase II of this Study.

Respectfully submitted,

Harold L. Michael

Harold L. Michael
Associate Director

HLM:ms

cc: W. L. Dolch
R. L. Eskew
W. H. Goetz
W. L. Grecco
M. J. Gutzwiller
G. K. Hallock
R. H. Harrell
M. L. Hayes
C. W. Lovell
G. W. Marks
R. D. Miles
J. W. Miller
C. F. Scholer
M. B. Scott
J. A. Spooner
N. W. Steinkamp
H. R. J. Walsh
E. J. Yoder

Digitized by the Internet Archive
in 2011 with funding from
LYRASIS members and Sloan Foundation; Indiana Department of Transportation

http://www.archive.org/details/treatmentofsanit7227etze

Final Report

Phase II

TREATMENT OF SANITARY WASTES AT INTERSTATE REST AREAS

COMPILATION AND EVALUATION OF PERFORMANCE AND COST DATA OF EXISTING WASTE DISPOSAL SYSTEMS IN USE AT REST STOP AREAS IN INDIANA

by

James E. Etzel, Professor of Environmental Engineering
A. J. Steffen, Associate Professor of Environmental Engineering
David W. Hawkins, Professional Assistant
John Heckler, Graduate Assistant in Research

Joint Highway Research Project
Project No.: C-36-67F
File No.: 9-11-6

Prepared as Part of an Investigation
Conducted by
Joint Highway Research Project
Engineering Experiment Station
Purdue University
In cooperation with the
Indiana State Highway Commission
and the
U.S. Department of Transportation
Federal Highway Administration

The contents of this report reflect the views of the author who is responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

Purdue University
West Lafayette, Indiana
September 7, 1972

This is the final report on the second phase of the three phase study of "Treatment of Sanitary Wastes at Interstate Rest Areas", as outlined in the plan of study submitted by Dr. J.E. Etzel, Professor of Environmental Engineering, School of Civil Engineering, Purdue University, October 28, 1970. This phase, known as phase II, involving the evaluation of existing systems, has been prepared by Professor A.J. Steffen, Mr. David W. Hawkins and Mr. John Heckler serving as the principal investigators, since this phase of the project would not produce results suitable for use in a graduate thesis.

Field Survey Study

During the peak month of rest stop usage, which has been determined as August by several other studies, a comprehensive survey of 7 rest stops on Interstate Highways in Indiana was conducted in 1971 to determine the basic parameters involving usage and problems of the waste treatment systems. Table II gives a listing of the rest stop areas sampled, their average daily waste flows, and BOD, solids and pH data on influent and effluent, and COD on influent. Grab samples were collected on different days of the week and at different times in an effort to produce representative data. The number of samples collected at each rest area is shown in Col. 18. Ranges are given in Table III. Population (usage) data was limited to scattered counts during daytime hours and attempts to statistically correlate the rest stop usage with flow and pounds of BOD gave very little significance. In the case of flow, the indications were approximately 30 gallons per person entering the rest stop area per day, yet the national average data for this same parameter indicates 5 to 6 gallons per person entering the rest stop per day. In the case of BOD, the correlation was seemingly better than in the case of flow, judged on the basis that an R value of .78 was obtained from

a regression analysis. This regression analysis indicated a value of 0.037 pounds of BOD per person entering the rest stop per day. A further correlation based on the fact that the flow and BOD data were far more accurately determinable than was the population entering the rest stop per day develops a figure of 0.007 which accordingly appears more accurate for design purposes. The biggest difficulty in the surveying of the existing rest stops was in determining the total usage of the rest stop each day and so the more reasonable design parameter of 0.007 would seem to be the reliable number.

The apparent increase in suspended solids in samples collected at the Plainfield rest area is due to a single high analysis resulting from difficulties in sampling during a low flow period, probably due to the excessively large final clarifier at this plant which may have developed anaerobiosis.

No lagoon effluent samples were collected because the standard BOD test, in the absence of light, would be artificially increased by the algae.

The treatment plants are all of the extended aeration package type and show reasonable efficiencies. The data at Plainfield was affected by effluent BOD's of 98 and 99 mg/l on Saturday and Sunday, August 28 and 29, possibly caused by the same conditions that may have affected the suspended solids data from this plant.

Analysis of Design Parameters As Compared With Data Developed In Above Described Study

It is understood that the information compiled in the following will be correlated with similar data from other states. Therefore, complete details are provided in the accompanying tables.

Appendix A of this report describes the rest areas studied, in-

cluding location, type of plant, and other pertinent data, along with a typical flow diagram.

The cost data in Table IV shows total costs as well as cost per thousand gallons per day and costs per pound of raw BOD treated daily. These costs are relatively high compared with the usual installed costs of extended aeration package plants in the same size range but it must be recognized that the cost in Table IV also includes construction of sewers and the lagoons. It is evident that the costs bear little relationship to the pounds of BOD in these small units and that the cost is principally related to hydraulic size.

Except for the unusually low influent BOD and high flows at the Pipe Creek southbound and northbound rest area plants, the BOD concentrations and daily flow levels in Table V show reasonable correlation between the survey data and the design bases. The unusually high BOD concentration used as a design parameter for the Plainfield plant is due to the low per capita flow assumed (1.9 gpcd). The results at Pipe Creek indicate possibilities that some clear water was entering the system on a more or less continuous basis. This might be due to a number of causes such as infiltration into the raw waste sewer, flush valves or lavatory valves remaining open or partially leaking or leakage of fresh water from the water supply system.

Table VI presents the summary unit data obtained from the field survey and compares it with the design data. Inasmuch as the purpose of this phase of the study is to determine existing conditions at a number of representative rest areas in Indiana, as background for development of basic design criteria for a full-scale unit employing effluent recycle as compared with effluent discharge, a detailed analytical discussion on this accumulation of data would not directly serve the pur-

poses of this report, and therefore only general comments will be made.

The plants are for the most part, substantially underloaded and accordingly BOD loadings are low. The extremely low loadings at Lizton and Plainfield both located relatively short distances west of Indianapolis, may be due to low usage. The low BOD loading at Waynestown and Lizton also indicates that the 553 mg/l BOD concentration used in the design was excessive, considering that hydraulic parameters match well with the survey data. The design loading at Waynestown and Plainfield (16 lbs. of BOD per 1000 cu. ft.) is in excess of the 12.5 lbs. of BOD per 1000 cu. ft. stated as permissible loading for extended aeration plants in the "Recommended Standards for Sewage Works", adopted by the Great Lakes - Upper Mississippi River Board of State Sanitary Engineers (1971 revised edition), but it is doubtful whether these loadings will be approached in the next decade.

Table VII provides some of the clues to the results in Table VI. It should be noted particularly that the Pipe Creek and Greenfield plants were designed on the basis of BOD loadings of 0.007 lbs/capita, whereas Waynetown, Lizton and Plainfield were designed on 0.03 lb. loading bases. It should also be noted that the Plainfield plant was designed on a very low per capita hydraulic load, that is, 1.9 gal/cap/day.

Conclusions

From this study it may be concluded that the design of the proposed plant in Phase III should be based upon approximately 5.0 gal/cap/day and 0.007 to 0.010 lb. of BOD/cap. However, much of the success of a treatment facility depends upon the accuracy with which populations can be predicted. Thus it is recommended that comprehensive traffic data should be collected for the location of the study in Phase III.

TABLE I

Representative Influent and Effluent
Wastewater Characteristics

Date	Influent			Effluent		MLSS
	BOD	BOD filtered	SS	BOD	SS	
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
11/24/71	450	378	61	9.5	6.2	5010
11/26/71	264	-	358	5.1	1.5	4660
11/28/71	159	27	278	3.2	2.8	5760
11/30/71	167	108	110	6.4	4.0	6230
12/4/71	198	137	102	4.7	2.2	7660
12/6/71	238	30	85	1.8	2.2	7730
12/8/71	139	100	60	2.2	0.0	7920
12/10/71	383	283	120	3.8	1.0	7610
12/14/71	164	101	118	2.3	2.2	7790

TABLE II

Highway Rest Area - Waste Treatment Plant Survey
Flow and Analytical Data (Averages) - Surveyed August 1971

Rest Area & Highway	Ave. Flow gpd	No. of Consec. Days of Flow Data	Infl. (Raw) BOD mg/l	Infl. (Raw) BOD lbs/day	Effl. BOD mg/l	Effl. BOD lbs/day	BOD Removal %
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Waynetown - I74	12,950	25	192	20.7	35	3.8	82
Lizton - I74	7,800	25	116	7.5	5	3.2	96
Plainfield - I70	24,270	25	115	23.3	59	1.2	40
Pipe Creek - I69 Southbound	9,700	11	30	2.0	19	1.3	37
Pipe Creek - I69 Northbound	20,850	16	56	9.7	18	3.1	68
I70 - Greenfield Eastbound	14,960	25	143	17.8	23	2.9	84
I70 - Greenfield Westbound	7,730	25	161	10.3	16	1.0	90

TABLE II (con't)

Rest Area & Highway	Suspended Solids Inf. mg/l (9)	Suspended Solids Effl. mg/l (10)	Suspended Solids % Removal (11)	Vol.Susp. Solids Inf. mg/l (12)	Vol.Susp. Solids Effl. mg/l (13)	Vol.Susp. Solids % Removal (14)	COD Inf. mg/l (15)	pH Inf. (16)	pH Effl. (17)	No. of Samples (18)
Waynetown-I74	177	63	64	163	55	66	639	8.0	7.2	6
Lizton-I74	197	10	91	97	7	93	338	7.8	7.2	6
Plainfield-I70	135	146	-	119	90	24	353	7.5	7.2	7
Pipe Creek-I69 Southbound	21	20	5	21	20	5	81	7.6	7.7	3
Pipe Creek-I69 Northbound	25	10	60	25	10	60	109	7.7	7.1	3
I70-Greenfield Eastbound	119	59	50	119	58	50	399	7.5	5.9	8
I70-Greenfield Westbound	119	10	91	111	8	93	424	7.7	7.0	8

TABLE III

Highway Rest Area - Waste Treatment Plant Survey
Minima & Maxima - Analytical Data

Rest Area & Highway	Flow	BOD mg/l		Suspended Solids mg/l		Vol. Susp. Solids mg/l		COD Inf. mg/l	pH	
		Infl.	Effl.	Inf.	Effl.	Inf.	Effl.		Inf.	Effl.
Waynetown - I74	8,225-17,325	76-458	18-69	16-800	9-192	16-720	8-152	213-2,125	7.1-8.3	6.5-7.3
Lizton - I74	4,590-12,130	70-135	0-11	52-194	1-19	50-194	1-15	132-424	7.2-8.2	6.9-7.8
Plainfield - I70	14,090-37,720	29-155	11-99	64-210	58-434	42-207	30-244	214-460	6.5-8.1	7.0-7.5
Pipe Creek - I69 Southbound	6,200-15,880	19-38	9-38	8-31	2-31	8-20	2-20	34-99	6.9-7.8	7.3-7.5
Pipe Creek - I69 Northbound	12,440-33,920	21-780	5-26	4-52	4-22	4-51	4-22	63-174	7.1-7.9	6.7-7.5
Greenfield I70 Eastbound	3,560-33,280	4-375	10-41	12-542	28-84	12-542	28-82	179-885	6.6-8.1	5.8-6.5
Greenfield I70 Westbound	5,120-12,000	6-600	2-73	12-332	4-26	12-328	3-26	87-1530	7.0-8.1	6.3-7.4

TABLE IV

Cost Data

Rest Area Study: Wastewater Treatment Plants

Rest area - Highway	Total Cost	Cost Related to Design Parameters	
		Cost/1000gpd	Cost/lb. BOD (Raw) Treated per day
Waynetown I-74	$47,074(1970)	$4,230	$96
Lizton I-74	$54,600(1968)	$4,890	$110
Plainfield I-70	$62,000(1970)	$2,640	$300
Pipe Creek I-69 Southbound	$20,000(1966)	$3,380	$1,900
Pipe Creek I-69 Northbound	$20,000(1966)	$3,380	$1,900
Greenfield I-70 Eastbound	$44,000(1967)	$3,660	$2,090
Greenfield I-70 Westbound	$44,000(1967)	$4,400	$2,510

TABLE V

Indiana Rest Area Waste Treatment Plant Survey

BOD & Flow

Comparison Between Survey Data & Design Basis

	BOD - mg/l		Flow - gals/per/day	
	Survey Data	Design Basis	Survey Data	Design Basis
Waynetown I-74	192	553	12,950	11,128
Lizton I-74	116	553	7,800	11,115
Plainfield I-70	115	1,050	24,270	23,446
Pipe Creek I-69 Southbound	30	210	9,700	6,000
Pipe Creek I-69 Northbound	56	210	20,850	6,000
Greenfield I-70 Eastbound	143	210	14,960	12,000
Greenfield I-70 Westbound	161	210	7,730	10,000

TABLE VI

SUMMARY DATA - FIELD SURVEY VS. DESIGN

(All data except "Detention Time" is expressed on a per day basis)

AERATION

Rest Area	Detention Time (hrs)		Air Supply (One Blower) ft^3/lb BOD		BOD Load lbs BOD/1000 ft^3	
	Survey	Design	Survey	Design	Survey	Design
Waynestown I-74	45.0	51.7	9,700	2,400	6.5	16
Lizton I-74	92.5	64.0	14,000	2,100	1.9	12.9
Plainsfield I-70	101.	105.	18,600	2,100	1.7	15.0
Pipe Creek I-69 Southbound	14.9	24.0	43,200	6,850	2.3	12.1
Pipe Creek I-69 Northbound	6.9	24.0	8,900	6,850	11.2	12.1
Greenfield I-70 Eastbound	20.3	25.0	4,050	3,430	10.6	12.5
Greenfield I-70 Westbound	32.6	25.0	7,000	4,120	6.1	12.5

TABLE VI (con't)

Rest Area	FINAL CLARIFICATION Detention Time (hrs)		Surface Gals/ft^3		LAGOON Detention - Days	
	Survey	Design	Survey	Design	Survey	Design
Waynestown I-74	7.4	8.6	130	111	7.1	8.0
Lizton I-74	8.9	6.0	78	111	11.2	8.0
Plainsfield I-70	17.0	19.4	53	45	6.8	7.0
Pipe Creek I-69 Southbound	2.8	4.6	258	158	4.9	7.8
Pipe Creek I-69 Northbound	1.3	4.6	560	158	2.2	7.8
Greenfield I-70 Eastbound	3.2	4.0	315	253	5.7	7.0
Greenfield I-70 Westbound	6.2	4.0	163	210	10.9	6.5

TABLE VII

Unit Loadings on Which

Designs Were Based

	Gals. per capita per day	LBS. BOD per capita
Waynetown I-74	6.5	0.03
Lizton	6.5	0.03
Plainfield	1.9	0.03
Pipe Creek I-69 Southbound	4.0	0.007
Pipe Creek I-69 Northbound	4.0	0.007
Greenfield I-70 Eastbound	4.0	0.007
Greenfield I-70 Westbound	4.0	0.007

Phase II - Final Report

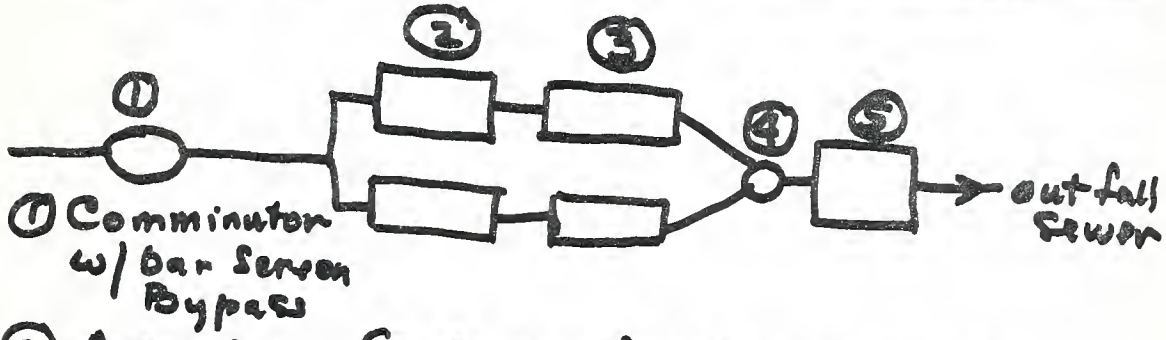
Appendix A.

1) Description of Rest Area Sites

2) Typical Flow Diagram (see below)

3) Design Parameters of existing Wastewater Treatment Plants At these Rest Areas

Typical Flow Diagram (Same for all plants)



2 Aeration (Extended Aeration) tanks (two tanks except at Pipe Creek and greenfield Plants, where each plant has one aeration tank and one final Planifier)

3 Final Clarifiers (See note under aeration 2)

4 Chlorination Contact Tank (except Pipe Creek)

5 Terminal Lagoon

1. Description of Waynetown Highway Rest Area Sewage Treatment Plant:

Location: This plant serves two rest areas serving opposite lanes of Interstate Highway 74, midway between Waynetown and Hillsboro, (Fountain County, Indiana), and about 40 miles northwest of Indianapolis. The treatment plant is on the south side of the highway.

Engineers: Henry B. Steeg and Associates, Inc., and Indiana State Highway Commission.

General Description: Extended aeration type wastewater treatment plant, with effluent chlorination and a terminal lagoon, discharging to an unnamed ditch bordering the New York Central Railroad tracks. The ditch enters the east fork of Coal Creek 1/2 mile from the site, a tributary of the Wabash River at Cayuga.

Design Basis: Population: 1,712 users of restrooms per day (1990)

At 6.5 gal. per cap. per day = 11,128 gpd

BOD Design Load = 1712 x 0.03 lbs/cap. = 51.4 lbs. BOD/day

Plant Elements:

(1) Comminutor at 0.03 mgd cap., bar screen bypass

(2) Two aeration tanks: each 19' x 10' x 9' S.W.D.

Total cap. = 24,000 gal.

Air Supply = two blowers (one is standby), each 95 cfm, to include 10 cfm used for air lift in final clarifiers, for sludge return.

(3) Two final clarifiers: each 10'x5' x 9' S.W.D., with hopper bottoms; air lift for sludge return (four 2" dia. air lifts).

(4) Chlorination: Gas feed chlorinator 1.5 lb/day capacity

Contact Tank 48" dia. x 5' S.W.D. = 470 gal.

(60 minute detention at design flow)

(5) Terminal Lagoon: 70' x 35' x 5' S.W.D. = 92,000 gal.

2. Description of Lizton Highway Rest Area Sewage Treatment Plant:

Location: This plant serves two rest areas serving opposite lanes of Interstate Highway 74 and is located in Hendricks County, Indiana, on the south side of the highway about one mile west of the State Road 39 interchange and about 10 miles northwest of Indianapolis.

Engineers: Henry B. Steeg and Associates, Inc., and the Indiana State Highway Commission.

General Description: Extended aeration type wastewater treatment plant, with effluent chlorination and a terminal lagoon, discharging into Ross Ditch (East fork of Walnut Creek). Headwaters of proposed Big Walnut Reservoir flood control pool would be about 12 to 15 miles downstream.

Design Basis: Population: 1710 people (users of restrooms) daily (1990)

At 6.5 gpcd = 11,115 gal/day

BOD Design Load = 1,710 x 0.03 lbs./user = 5.13 lbs. BOD/day

Plant Elements:

(1) Comminutor: at 0.03 mgd cap., with bar screen bypass

(2) Two aeration tanks: each 20.5' x 10' x 9.8' S.W.D.
Total Capacity = 30,000 gal.

Air Supply: two blowers (one is standby), each supplying 2,100 $ft.^3$/day/lb BOD plus air lift for final clarifiers sludge return.

(3) Two final clarifiers: each 5' x 10' x 9.7 S.W.D. with hopper bottoms, sludge return via 2 inch air lift in each tank.

(4) Chlorination: Gas feed chlorinator
Contact tank 48" dia. x 5' S.W.D. = 470 gal. cap., 60 minutes detention at design flow.

(5) Terminal Lagoon: 61' x 61' x 5' S.W.D. = 87,500 gal.
(outfall sewer = 7000 ft., 8" dia.)

3. Description of Plainfield Highway Rest Area Sewage Treatment Plant:

Location: This plant serves two rest areas serving opposite lanes of Interstate Highway 70 near Plainfield, Indiana, (Hendricks County), about 10 miles southwest of Indianapolis.

General Description: Extended aeration type wastewater treatment plant, with effluent chlorination and terminal lagoon.

Design Basis: Population:- 6,849 users of restrooms per day (1990)
At 1.9 gal. per cap. per day = 23,446 gal/day
(water use based on 7.6 gals. per vehicle and 3,085 vehicles daily, averaging 3 persons per vehicle and 74% using restrooms)

Bod Design Load = 0.03 lbs per cap. per day = 205.5 lbs/day

Plant Elements:

(1) Comminutor with bar screen bypass

(2) Two aeration tanks: each 12' x 56' x 10.25' S.W.D.
Total capacity = 102,500 gal.

Air Supply = three blowers (one is standby), each 160cfm, to include 10 cfm for air lifts in final clarifier.

(3) Two final clarifiers: each 12' x 19' x 5' S.W.D., (not including 5' hoppers).

(4) Chlorination: Gas feed chlorinator

Control tank 6' dia. x 4.2' S.W.D.

(5) Terminal lagoon: 164,122 gals. cap.

4. Description of Pipe Creek Highway Rest Area Sewage Treatment Plant: (separate plants for southbound and northbound rest areas)

Location: Two separate sewage treatment plants are provided, one to serve the rest area on the southbound side and the other the northbound side of the Interstate Highway 69, on the Delaware-Grant County Line, 3 miles south of the State Road 26 interchange and about 66 miles northeast of Indianapolis. The two rest areas are opposite each other.

Engineers: Indiana State Highway Commission

General Description: Each of these two treatment plants is of the extended aeration type with effluent chlorination and a single terminal lagoon serving the two plants. The lagoon discharges to Edwards Ditch, thence to Pipe Creek.

Design Basis: Population: 1,476 people (users of restrooms) daily, at each rest area (1990)

At 4 gal per cap. per day, each plant was designed for 6000 gal/day (4 x 1476 = 5,904 gal.)

BOD Design Load = .006 mgd x 8.34 x 210 mg/l BOD

= 10.5 lbs. BOD/day

Plant Elements: Two plants are identical.

(1) Comminutor with bar screen bypass

(2) One aeration tank at each plant: 18' x 6.25' x 7.33'S.W.D. Capacity 6000 gals.

Air supply: one blower (each plant) 60 cfm
plus one standby blower 60 cfm,
including supply for air lifts for final clarifiers.

(3) One final clarifier at each plant:
6.25' x 6' x 7.33' S.W.D. plus hopper bottom
Sludge return - each has two 20 gpm air lift pumps

(4) One terminal lagoon serving both plants: 94,500 gal.

(5) Lift station with submersible pumps discharge lagoon effluent to effluent sewer.

5. Description of Greenfield Highway Rest Area Sewage Treatment Plant: (separate plants for two rest areas, eastbound lane and westbound lane).

Location: Eastbound plant at eastbound rest area, located on I-70 about 3.4 miles east of State Road 9 interchange (Hancock County). Westbound plant at westbound rest area 5.5 miles east of State Road 209 (Henry County). Separation distance approximately 6.5 miles, with interchange between them, resulting in different traffic patterns and two treatment plants with different designs due to different loadings. Eastbound area is approximately 19 miles east and westbound 24.5 miles east of Indianapolis.

Engineers: Mussett, Nicholas & Stevenson, Inc., and Indiana State Highway Commission

General Description: Each plant is of the extended aeration type with chlorination and terminal lagoon. Eastbound area plant discharges to 15" county drain tile, thence to Little Brandywine Creek. Westbound area plant discharges to 10" county drain tile, thence to Million Brook which discharges to Six Mile Creek.

Design Basis: Population: Eastbound 2,710 (users of restrooms) (1990)

Westbound 2,140 (users of restrooms) (1990)

At 4 gal per cap. per day:	Eastbound	Westbound
	10,840 gpd	8,560 gpd
BOD load at 210 mg/l:	21 bls/day	17.5 lbs/day

Plant Elements:	Eastbound	Westbound
(1)	Comminutor with bar screen bypass	same as eastbound
(2)	One aeration tank 17.25' x 10' x 9.75' S.W.D. cap. 12,600 gal Air: 60 cfm blower + spare (air supply includes airlift for final clarifiers)	one aeration tank 14.75' x 10' x 9.5'S.W.D. cap. 10,500 gal 60 cfm blower + spare
(3)	One final clarifier 4.75' x 10' x 9.75' S.W.D. (Plus hopper bottom) Air lift sludge return	One final clarifier 4.75' x 10' x 9.5'S.W.D. (plus hopper bottom) Air lift sludge return
(4)	Chlorination	Chlorination
(5)	Lagoon 50' x 45' x 5' = 84,500 gal	Lagoon 50' x 35' x 5' = 65,600 gal.
(6)	Lift station to county drain Two pumps each 100 gpm at 20 ft. TDH	Lift station to county drain Two pumps each 100 gpm at 20 ft. TDH